Remarks/Arguments

These remarks are in response to the Final Office Action dated October 21, 2005. This reply is timely filed.

At the time of the Final Office Action, claims 1-14 were pending in the application. Claims 1-14 were rejected under 35 U.S.C. §103(a). Claims 1 and 8 have been amended to provide proper antecedent basis for certain claim elements and for greater clarity. Claim 14 has been amended to further clarify the dependency of the claim. The rejections are set out in more detail below.

I. Brief Review of Applicants' Invention

Prior to addressing the Examiner's rejections, a brief review of Applicants' invention is appropriate. The invention is directed to a specific problem associated with the situation where a wireless base station communicates with a plurality of spatially separated repeaters. In conventional systems, different repeaters typically have been assigned different RF frequencies for backhaul communications with the same base station. The use of different RF frequencies tended to prevent communications on one repeater's backhaul link from interfering with communications on another repeater's backhaul link.

However, when an RF frequency is dedicated to a particular repeater for backhaul communications, it is then no longer available for other uses. Notably, the RF frequency typically remains unavailable even if the repeater to which it is assigned is inactive. This represents an inefficient use of RF spectrum. The invention solves the foregoing problem by allowing use of the same RF frequency for backhaul communications between a base station and multiple repeaters. This advancement is made possible by the use of an adaptive or "smart" antenna system at the base station. The adaptive antenna technology allows the base station to spatially isolate communications on a first RF backhaul of a first repeater from communications on a second RF backhaul of a second repeater. This feature also permits the same RF carrier frequency to be reused more frequently within a group of cells. Implementing multiple repeater backhaul links that operate using the same RF frequency, either within

a cell or among a group of cells, can be highly advantageous as it increases the available bandwidth for ground link communications with mobile communication devices.

II. Rejection of Claims 1-4 and 8-11 Based on Bongfeldt

In the Office Action, claims 1-4, 8-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Published U.S. Patent Appln. No. 2002/0045431 to Bongfeldt ("Bongfeldt"). Bongfeldt does disclose a wireless repeater communicating with a wireless base station. However, Bongfeldt provides no suggestion of any method for reducing the number of carrier frequencies required for backhaul communications between a single base station and multiple repeater stations. In fact, Bongfeldt is not directed to this problem at all. Instead, Bongfeldt merely discloses a system for an intelligent gain controller used in an on-frequency repeater (Bongfeldt, ¶3).

Bongfeldt does note that smart antenna technology can be used at a base station (Bongfeldt, ¶80). However, Bongfeldt discloses the use of such technology for communications between a base station and a subscriber's wireless communication device (WCD), such as a cell phone (Bongfeldt, ¶80, lines 7-12). Bongfeldt makes further reference to direct base station-WCD communications by stating that, "the WCD's antenna must be omni-directional to successfully connect to, and communicate with, the base station 4." (Bongfeldt, ¶80, lines 12-18). In summary, Bongfeldt does not disclose or suggest the use of smart antenna technology for the backhaul link between the repeater and the base station.

According to the Examiner, claims 1-4 and 8-11 would have been obvious based on the Bongfeldt reference. The Examiner contends that it would be obvious to modify the base station of Bongfeldt such that it includes smart antenna technology. While the use of smart antenna technology on base stations for communications with WCDs is known in the art, its application to RF repeater backhaul links is not. In particular, Bongfeldt does not teach the use of smart antenna technology to spatially isolate repeater backhaul communication links between the various repeaters and the base

station operating on the same RF carrier frequency, as recited in amended independent claims 1 and 8.

In order to better appreciate Applicant's invention, it is important to place it within the context of how conventional wireless communication systems have been currently designed. Conventional wireless communications systems include base stations and repeaters which are physically fixed within a cell or cluster of cells. There are circumstances when designers are plagued by RF interference caused by omni-directional transmission between base stations and repeaters. In order to mitigate backhaul interference, multiple directional antennas at the base station can be used to establish a dedicated receiving/transmitting RF backhaul link. Applicant was the first to recognize the advantage of applying smart antenna technology for RF repeater backhauls. Thus, the invention advantageously eliminates the costly need for multiple directional antennas at the base station, while providing greater directional efficiency and reduction in backhaul interference.

In order to render a claim unpatentable as being obvious over a prior art reference, there must be at the very least some suggestion or motivation, either in the reference or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. The Bongfeldt reference falls short of satisfying this requirement. The antenna modification that the Examiner asserts to be present in the cited reference (i.e. employing smart antenna technology at the base station) is directed towards mitigating any interference in a WCD-base station uplink/downlink (Bongfeldt, ¶80). Therefore, Bongfeldt does not even recognize the problem addressed by Applicants, which is improving spectrum and reuse efficiency with regard to repeater backhaul channels (Applicants' specification, ¶2, 11, and 12). Given the foregoing, there is nothing to suggest that the claimed invention would have been within the knowledge of persons of ordinary skill in the art. Accordingly, Applicants believe that the Examiner's rejection of claims 1-4 and 8-11 based on Bongfeldt should be withdrawn.

III. Rejection of Claims 5-7 and 12-14 Based on Bongfeldt in View of Dean

Claims 5-7, and 12-14 were ejected under 35 U.S.C. §103(a) as being unpatentable over Bongfeldt in view of U.S. Patent No. 5,771,017 to Dean ("Dean"). However, Dean fails to make up for the deficiencies of Bongfeldt. Dean, like Bongfelt, does not disclose, suggest, or motivate any method for reducing the number of carrier frequencies required for backhaul communications between a base station and multiple repeater stations. In fact, Dean is not directed to the problem of repeater backhaul communications at all. Instead, Dean relates to a specific implementation of a smart antenna for communications between a base station and a mobile station (Dean, Fig. 3.). Moreover, Dean makes no mention of a repeater. Consequently, claims 5-7 and 12-14 are believed to be patentable at least by virtue of their dependence upon an allowable base claim.

IV. Conclusion

For the foregoing reasons, this entire application is believed to be in condition for allowance. Consequently, such action is respectfully requested. The Applicants request that the Examiner call the undersigned if clarification is needed on any matter within this Amendment, or if the Examiner believes a telephone interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,

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